

Charged–Thermodynamic Reformulation of Cosmic Dynamics: The TQTU Alternative to Λ CDM

Prof. Dr. Md. Faridul Islam Chowdhury
Tanfarid Vision Research Institute, Bogura, Bangladesh

September 29, 2025

Abstract

We present the Charged–Thermodynamic Reformulation of cosmic dynamics within the framework of the Tanfarid Quantum Thermodynamic Universe (TQTU). This approach decisively rejects the speculative constructs of Dark Matter and Dark Energy. TQTU asserts that all observed astrophysical effects—such as flat galactic rotation curves and cosmic acceleration—must be explained exclusively through detectable entities: charged particles, electromagnetic fields, and thermodynamic tension (τ -Autorunner). Using Farid’s Two-Equation Model (FTEM), we demonstrate that galactic dynamics arise from a charged plasma potential (Φ_{Lattice}), while cosmic acceleration originates from a universal thermo-tension (P_τ). This framework offers a unified, parsimonious, and observationally verifiable alternative to the Λ CDM paradigm. Importantly, mathematics is employed solely as the language of science, not as evidence itself.

1 Core Principle: No “Dark” Shadow

TQTU Principle: If a phenomenon exists, it must be physically detectable.

- If there is a subatomic particle, we call it a particle.
- If it exerts pressure, it is a particle.
- If an instrument can detect it—optical, radio, X-ray, neutrino, or gravitational-wave—then it is real.

No instrument has ever reported a signal that can be identified as a “dark-matter particle.” Therefore, Dark Matter is a bookkeeping error: an artifact of applying Newtonian dynamics to extended plasma systems. TQTU never invokes invisible substances. Instead, it reformulates dynamics in terms of charged particles, plasma structures, and thermodynamic processes.

2 Galactic Dynamics without “Dark Matter”

Traditional models explain flat galactic rotation curves by postulating a spherical halo of invisible Dark Matter. In TQTU, this effect is reproduced naturally by the Charged Thermo-Lattice

Potential of the galactic plasma halo.

2.1 Effective Potential

The total gravitational–thermodynamic potential is:

$$\Phi_{\text{tot}}(r) = -\frac{GM_b(r)}{r} + \Phi_{\text{Lattice}}(r) \quad (1)$$

where $M_b(r)$ is the visible baryonic mass, and Φ_{Lattice} is the thermodynamic potential of the extended charged plasma:

$$\Phi_{\text{Lattice}}(r) = v_\infty^2 \ln\left(\frac{r}{r_0}\right). \quad (2)$$

2.2 Flat Rotation Curves

The orbital velocity follows:

$$v^2(r) = \frac{GM_b(r)}{r} + v_\infty^2, \quad (3)$$

which asymptotically yields a flat rotation curve:

$$v^2(r) \xrightarrow{r \rightarrow \infty} v_\infty^2. \quad (4)$$

2.3 Baryonic Coupling (BTFR)

The Baryonic Tully–Fisher Relation (BTFR) emerges directly:

$$v_\infty^4 = GM_b a_0(\tau), \quad (5)$$

with $a_0(\tau)$ as the universal thermo-acceleration scale linked to cosmic expansion:

$$a_0(\tau) = \chi c H(\tau) \quad \text{or} \quad a_0(\tau) = \tilde{\chi} c^2 \sqrt{\frac{\Lambda(\tau)}{3}}. \quad (6)$$

Thus, flat rotation curves are explained by real baryons + observable plasma halos, not invisible matter.

3 Cosmic Acceleration without “Dark Energy”

The apparent acceleration of cosmic expansion is not due to vacuum energy, but to a measurable Charged Thermo-Tension (P_τ) of the plasma lattice.

3.1 Thermodynamic Equation of State

The pressure and energy density satisfy:

$$P_\tau = -\rho_\tau c^2, \quad w = \frac{P_\tau}{\rho_\tau c^2} \simeq -1. \quad (7)$$

The energy density arises from the free energy of the charged plasma background:

$$\rho_\tau c^2 \sim \alpha \frac{k_B T_H(\tau)}{\lambda_\tau^3}, \quad T_H(\tau) = \frac{\hbar H(\tau)}{2\pi k_B}. \quad (8)$$

3.2 Observable Replacement for Ω_Λ

At the present epoch (τ_0):

$$\rho_\tau = \frac{3H_0^2}{8\pi G} \Omega_\Lambda, \quad P_\tau = -\frac{3H_0^2 c^2}{8\pi G} \Omega_\Lambda. \quad (9)$$

Here, Ω_Λ is not a dark fraction, but the observed ratio of plasma thermo-tension to the critical density.

4 Farid's Two-Equation Model (FTEM)

TQUTU reduces the cosmic dynamics to two transparent equations:

Galactic Dynamics (no Dark Matter):

$$\boxed{\Phi_L(r) = v_\infty^2 \ln\left(\frac{r}{r_0}\right), \quad v_\infty^4 = GM_b a_0(\tau)} \quad (10)$$

Cosmic Acceleration (no Dark Energy):

$$\boxed{P_\tau = -\rho_\tau c^2, \quad \rho_\tau = \frac{3H_0^2}{8\pi G} \Omega_\Lambda} \quad (11)$$

5 Observational Consistency

The validity of any cosmological framework rests not on speculative constructs but on direct observational tests. The TQUTU charge-thermodynamic paradigm is fully consistent with the best available experimental and astrophysical evidence:

5.1 Collider Constraints (LHC)

After 15 years of high-luminosity operation, the Large Hadron Collider (LHC) has reported no evidence for dark-matter production, systematically excluding the core parameter space of the most favoured WIMP and dark-sector models. This persistent null result supports the TQUTU position that no invisible dark-matter particle exists, and that galactic dynamics must instead be explained by charged plasma physics and thermodynamics.

5.2 Astrophysical Plasma Halos (Chandra / XMM)

X-ray telescopes such as Chandra and XMM-Newton consistently observe 10^7 K ionised plasma halos extending up to 100 kpc around galaxies. These halos provide precisely the additional

pressure and charge-separation effects required by the TQTU Charged Thermo-Lattice Potential, eliminating the need for an invisible halo of non-baryonic matter.

5.3 Radio Synchrotron Observations (VLA / LOFAR / SKA)

Large-scale radio interferometers (VLA, LOFAR, and the upcoming SKA) detect diffuse synchrotron emission from relativistic electrons spiralling in microgauss (μG) galactic magnetic fields. This directly demonstrates the charged plasma structure of halos, consistent with TQTU predictions.

5.4 Voyager Plasma Measurements

Both Voyager 1 and Voyager 2 plasma wave instruments detected a sharp increase in local electron density upon crossing the heliopause (~ 120 AU). These findings prove that plasma environments dominate large-scale boundaries, providing a local analogue to galactic halos. In contrast, no dark-matter signal was observed.

5.5 Conclusion of Consistency Tests

Taken together, these independent lines of evidence demonstrate:

- No collider evidence for dark-matter particles.
- Direct X-ray and radio detection of plasma halos.
- In-situ spacecraft confirmation of plasma dominance at cosmic boundaries.

Thus, the TQTU reformulation—grounded in charged particles, observable plasma, and thermodynamic tension—is not only conceptually elegant but also empirically validated by modern instruments.

6 Closing Rule

If an instrument cannot detect it, it does not exist. “Dark Matter” and “Dark Energy” fail this test. Charged plasma and thermodynamic tension pass it—today, with existing data.

No dark shadow, no invisible matter: only charged particles and thermodynamics.

References

- [1] Chowdhury, M.F.I. (2025). The Charge-Separated Halo: A Plasma Solution to the Galactic Rotation Problem.
- [2] Chowdhury, M.F.I. (2025). The Emergent Dark Sector: A Unification of Cosmic Dynamics in the TQTU Framework.
- [3] Chowdhury, M.F.I. (2025). The Impossibility of Parallel Matter Distribution from a Point Explosion: A Thermodynamic Refutation of Big Bang Geometry.

- [4] Chowdhury, M.F.I. (2025). From Mechanical Flow to Thermodynamic Clock: Time in the TQTU Framework.